



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 4

ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

MAR 02 2017

Dr. Judi Krzyzanowski
Krzyzanowski Consulting
1967 Moira Road
Roslin Ontario, Canada K0K 2Y0

Dear Dr. Krzyzanowski:

We have received your July 5, 2016, letter ("July letter") requesting a determination regarding the applicability of 40 CFR Part 60 Subpart CCCC – "Standards of Performance for Commercial and Industrial Solid Waste Incineration (CISWI) Units" for your client, the Carbon Black Global LLC (CBG) facility in Dunlap, Tennessee. The request relates to a pilot "scaled-down" unit that will be used to optimize and research the gasification of a variety of carbon-based waste feedstocks for clients. Based on our review of the July letter and the additional information provided by CBG on August 23, 2016, September 16, 2016, and December 12, 2016, we have determined the proposed operation of the pilot unit is not a CISWI unit and will not be subject to Subpart CCCC.

In the July letter, you provided the following details about the CBG pilot unit. The process will gasify a variety of carbon-based feedstocks by using downdraft gasification to produce charcoal or activated carbon and synthetic gas (syngas) for energy production. The pilot unit operated by CBG will handle no more than 100 pounds of feedstock at a time, and no more than one batch of any feedstock will be processed in any given day. Municipal Solid Waste (MSW) will be tested in the pilot unit as a feedstock no more than twice each quarter, for a maximum of eight batches of MSW per calendar year, and at no time in excess of 30 percent of the load by weight (estimates are that it will remain below 12 percent).

The process in the CBG pilot unit begins by loading the reactor vessel with a 10-inch layer of charcoal on top of a perforated base. The feedstock is loaded on top of the charcoal. The reactor vessel is then placed into an autoclave where gasification occurs. Temperature, pressure, and air/oxygen levels in the autoclave will be regulated, partially through the use of steam injection, and will be optimized for each individual feedstock. The syngas produced in the process will then be passed through a set of two packed-tower wet scrubbers followed by a fabric-filter before being diverted to a flare. In real-world client applications the syngas will be used to produce energy, but due to the research and development nature of the CBG pilot unit the syngas will be flared off. The results from waste feedstock test batches will be used to optimize the process for each waste feedstock in order to increase efficiency and reduce emissions. The July letter describes that at no time does combustion of the waste feedstock occur, and both temperature and air content within the autoclave are highly regulated to ensure this.

In an email to the U.S. Environmental Protection Agency on August 23, 2016, you provided a temperature profile showing four different time and temperature profiles associated with different test conditions (minimum temperature/minimum time, minimum temperature/maximum time, maximum temperature/minimum time, and maximum temperature /maximum time). On September 16, 2016, you provided a document to elucidate the temperature profile. Our understanding of the temperature profile

and documentation is that it depicts, for the first five minutes, the ignition of the charcoal using non-solid waste fuel (i.e., natural gas or light fuel oil) with the addition of five percent (volume) compressed air for combustion.

In a follow-up letter of December 12, 2016, ("December letter") you provided additional detail about the startup of the process and described that the flame used on cold-start is underneath the charcoal base and never comes into contact with the charcoal (and as stated in the July letter, never comes in contact with the waste feedstock). You also state that not all of the charcoal will be ignited before the ignition (intake) valve is closed to eliminate air intake, but that there is sufficient heat within the system to continue the heating of the charcoal base, and to initiate the gasification process. The EPA is able to discern this from the temperature profile; the temperature reaches 700 to 800°C due to the fuel-based flame and ignition of charcoal during the first five minutes of operation.

You also provided additional detail in the December letter regarding the operation of the ignition (intake) valve to ensure that oxygen levels are kept below those needed to sustain combustion. The process valves are solenoid valves with modulating valve controls (MVCs). The ignition MVC is able to regulate air intake to the fraction of a percent, and is responsible for the supply of five percent air into the system to initiate combustion of the lower charcoal layer, during the first five minutes. The MVC closely regulates the amount of air in the autoclave throughout the gasification process, allowing just enough oxygen to stimulate and maintain certain chemical processes, but not enough to initiate combustion. Steam acts as the primary supply of chemical oxygen in gasification reactions, but at no time during the process would there be enough oxygen in the system to allow for the combustion of waste feedstock.

Our understanding is that after the initial five-minute period, the fuel source and air/oxygen source are cut off and the unit is sealed, with the exception of holes at the top of the vessel that draw all gases upwards, out through the holes, down through the shield and into the scrubber via pressure differentiation. At this time, the gasification process begins, as there is no longer sufficient air/oxygen to support combustion. The EPA can see from the temperature curves that the gasification temperature, depending on the four different profiles, can range from 300 to 800°C. The temperature profile also shows a hot steam activation during the 45 to 180 minute time range causing the temperature to rise to 850°C, and which you state is done to improve the quality of the syngas. The temperature diagram indicates a cool steam quench is performed to bring the vessel temperature back down to between 70 and 100°C the intention of which, by your description, is to reduce the possible formation of secondary products such as dioxins and furans.

As indicated in §60.2010, Subpart CCCC applies to a new incineration unit that is a CISWI unit and that is not one of the types of units excluded under §60.2020. A *CISWI unit* is defined in §60.2265 as "any distinct operating unit of any commercial or industrial facility that combusts, or has combusted in the preceding 6 months, any solid waste as that term is defined in 40 CFR part 241. If the operating unit burns materials other than traditional fuels as defined in §241.2 that have been discarded, and you do not keep and produce records as required by §60.2175(v), the operating unit is a CISWI unit."

The EPA recognizes that gasification, by itself, is not combustion. According to your description, while there is combustion of the charcoal and external fuel (i.e., natural gas or light fuel oil) in the first five minutes of operation, the external fuel source and air are cut off, transitioning the process to gasification before combustion of the waste feedstock will occur. This also initiates the gasification process of the waste feedstock, which is required to produce the carbon black product and ultimately, the syngas. From

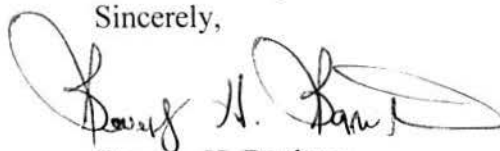
your description, we believe that the MVC is able to regulate the presence of oxygen in the system and to preclude combustion of the waste feedstock from occurring. Therefore, we do not believe that the unit meets the criteria that the unit is "any distinct operating unit of any commercial or industrial facility *that combusts, or has combusted* in the preceding 6 months, any solid waste as that term is defined in 40 CFR part 241" and, for this reason, Subpart CCCC does not apply to the gasification process described by CBG.

We note that for the CBG process, the resultant syngas will be flared. Subpart CCCC applies to the combustion of waste gases that are in a container when combusted (see §60.2265). Since the resultant syngas will not be in a container when combusted in the flare, Subpart CCCC will not apply to the flare.

While operation of the pilot unit by CBG will not be subject to Subpart CCCC, combustion of syngas produced by the gasification of other wastes, by CBG clients, should be evaluated by the appropriate delegated permitting agency for potential applicability under section 129 or section 112 (in the case of hazardous waste rules). For example, 40 CFR Part 60 Subpart EEEE applies to *other solid waste incineration units*, which include very small municipal waste combustion units and institutional waste incineration units. A *very small municipal waste combustion unit* is defined in Subpart EEEE as "any municipal waste combustion unit that has the capacity to combust less than 35 tons per day of MSW or refuse-derived fuel, as determined by the calculations in §60.2975." A very small municipal waste combustion unit may be exempt from Subpart EEEE if the criteria in §60.2887(b) are met. The criteria for being exempt include a requirement that a very small municipal waste combustion unit have a federally enforceable permit limiting the combustion of MSW to 30 percent of the total fuel input by weight. Subpart EEEE applies, in part, to the combustion of gasified MSW (i.e., syngas) produced by pyrolysis/combustion units. This applicability is similar to 40 CFR Part 60 Subpart AAAA – "Standards of Performance for Small Municipal Waste Combustion Units" which applies to municipal waste combustion units that have the capacity to combust at least 35 tons per day but no more than 250 tons per day of MSW or refuse-derived fuel.

This determination was coordinated with the EPA's Office of Enforcement and Compliance Assurance, the Office of General Counsel, the Office of Land and Emergency Management, and the Office of Air Quality Planning and Standards. If you have any questions concerning the determination provided in this letter, please contact Todd Russo at (404) 562-9194.

Sincerely,

A handwritten signature in black ink, appearing to read "Beverly H. Banister", is written over a horizontal line.

Beverly H. Banister

Director

Air, Pesticides and Toxics Management Division

cc: Sara Ayres, OECA
Marcia Mia, OECA
Nabanita Modak, OAQPS
George Faison, OLEM
Paul Versace, OGC

